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MEASURING RECREATION BENEFITS WITH CV: DOES PAYMENT VEHICLE MATTER?

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Abstract.–We use a payment card contingent valuation elicitation approach and two vehicles, user fees and increased general expenses to measure the annual net economic benefits to reservoir users at the Shasta-Trinity National Forest. In addition, we use analysis of covariance models in linear and Tobit forms to test the hypothesis that our payment vehicles are neutral. Our results indicate that user fees led to significantly lower annual individual surplus measures than did increases in general expenses and that there is considerable instability between the payment vehicles.

INTRODUCTION

Contingent valuation (CV) is one of a number of techniques used to value nonmarket goods and services. An attractive distinction of CV is that unlike other nonmarket methods, e.g., travel cost, hedonic pricing, or defense expenditure, CV does not rely on the assumption of secondary markets or weak complementarity. This distinction has led to CV's increasing use in applied valuation studies.

Although CV has been in use for over twenty years, debate continues among practitioners as to the best structure for the hypothetical market, payment vehicle, and elicitation approach. Despite over 1100 studies in published sources (Carson et al. 1993), and considerable evolution since the pioneering work by Davis (1963), CV appears to continue to require nearly as much artistry as science.

Early studies used open-ended (OE) (Cicchetti and Smith, 1973) or iterative bidding (IB) (Randall et al. 1974) elicitation approaches. These were followed by payment cards (PC) and PC-OE type hybrids (Boyle and Bishop 1988). Inference was based on simple sample statistics and OLS regression models. The dichotomous choice (DC) approach, pioneered by Bishop and Heberlein (1979) and refined by Hanemann (1984), emerged in the mid-eighties and has become exceedingly popular. Most recently, a hybrid of DC and IB has been developed called double-bounded dichotomous choice (DBDC) (Hanemann et al. 1991).

At present there is no consensus among practitioners as to which elicitation procedure is best. The recent National Oceanographic and Atmospheric Administration (NOAA) Panel, convened to assess CV as an environmental damage assessment tool (Arrow et al. 1993), appears to favor the DC or referendum approach, yet none of the panelists was experienced with the CV technique. Moreover, a number of recent studies appear to have successfully used alternatives to DC (see for example, Bowker and MacDonald 1993; Cameron and Huppert 1989; Reiling et al. 1989; Roberts et al. 1991).

Payment vehicles used for CV studies range, depending on a number of circumstances, from payments to trust funds, to entrance fees, higher taxes, and higher general expenses or price levels. Researchers contend that in general, the vehicle should be neutral with respect to the good, yet have a realistic relation to it (Cummings et al. 1986). In studies valuing aspects of recreation sites, entrance or user fees are often used. This vehicle, however, has drawn criticism for potentially restricting values to a range consistent with "fair" or customary entrance fees (Mitchell and Carson 1989). The possibility that people may ultimately have to pay for access to a given site could induce strategic behavior and a downward bias, and worse may be politically volatile for site managers.

In this paper we use a payment card elicitation approach and two vehicles, user fees and increased general expenses to measure the annual net economic benefits to reservoir users at the Shasta-Trinity National Forest. In addition, we use analysis of covariance models in linear and Tobit forms to test the hypothesis that our payment vehicles are neutral. Our results indicate that user fees, in the form of an annual vehicle pass, led to significantly lower annual individual surplus measures than did increases in general expenses. Such findings tend to corroborate previous research alleging a downward bias of CV surplus values obtained via user fee questions. In addition, we find an alarming instability of values across payment vehicles.

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METHODS AND DATA

The theoretical constructs of CV are well documented (Mitchell and Carson 1989). Equivalent variation or willingness-to-pay may be represented in an indirect utility framework as:

$$V_0(P_0,Y_0,Q_0)=V_0(P_0,Y_0-WTP,Q_1) \tag{1}$$

where, P_0 is a price vector, Y_0 is income, and Q_1 represents a state where a water level management alternative is guaranteed while Q_0 represents the status quo. In this paper we refer to one management level in a typical drought season and we attempt to capture household equivalent variation via the payment card elicitation procedure.

Two variations of the payment card were employed. In both cases, respondents were shown computer simulated pictures of the lakes at different times of the recreation season with supplemental information about the surface area, water level, and number of useable boat ramps. In one case, respondents were asked to report the maximum amount they would be willing to pay in additional annual expenses in order to continue using the lake, while in the other case they were asked for the maximum amount they would pay for an annual vehicle pass enabling them to continue using the lake (copies of the survey are available from the authors). The surveys were reviewed by a number of researchers, including CV practitioners, and pretested with focus groups on site.

Nine hundred questionnaires were distributed on site at both Shasta Lake and Trinity Lake during the recreation season (May to September) of 1992. A total of 239 of these questionnaires were returned by mail giving a response rate of 27 percent. Contrary to the Total Design Survey Method as articulated in Dillman (1978) and often adhered to (more or less) in CV survey procedures, no follow-up mailings were attempted. Of the 239 completed, 20 were incomplete and discarded. There were no identifiable protest responses. It should be noted that an alternative sample, administered via mailback which more closely follows Dillman (1978), was also obtained and will be analyzed in a subsequent paper.

Regression methods were used to analyze the WTP data and to test for payment vehicle stability. Two models were employed, a linear specification and a censored regression or Tobit model. The same set of concomitant variables was specified in each model. These variables included: income, quality (a Likert index), a binary variable to account for autonomous differences between the two lakes, and a binary variable to account for the payment vehicle effect. The linear model is presented in equation 2:

$$WTP_i=B_0+B_1Inc+B_2Qual+B_3Lake+B_4Pay+u_i \tag{2}$$

A large number of respondents reported a zero value for their annual WTP (104 out of 219 usable observations). Given this amount of censoring, a Tobit model was also estimated to circumvent the problems of bias and inconsistency attributable to Least Squares estimation (Greene 1990). The Tobit model is presented in equation 3:

$$\begin{aligned} WTP_i&=X_iB+u_i\,, &\quad \text{if } X_iB>u_i \\ WTP_i&=0\,, &\quad \text{if } X_iB\le u_i \end{aligned} \tag{3}$$

where the variables in the X matrix correspond to those listed in equation 2.

RESULTS

Results for the linear specification are reported in Table 1 and results for the Tobit model are reported in Table 2. In both cases, signs on parameter estimates for the regressors conform to intuitive priors. The continuous variables, quality and income, are statistically significant and positively influence WTP. Also, it appears that in neither model is WTP influenced by lake effects.

The parameter estimate on the binary variable for payment vehicle effects (1=increased expenses, 0=annual vehicle pass) is highly significant in both models. This result strongly suggests rejecting a maintained hypothesis that payment vehicle effects are neutral. Such a result indicates that mean WTP estimates are potentially very unstable across payment vehicles.

These results support conventional wisdom, that is, calculated mean WTP elicited via the vehicle pass is not only different but considerably lower than the mean WTP from the increased expenses question. Using the linear model and setting covariates at their sample averages results in a conditional expected WTP with increased expenses of \$66.63, while with the vehicle pass the conditional expected WTP is \$11.55.

Following Greene (1990), the censored mean WTP for the Tobit model may be calculated as:

$$E(WTP_i|X_i) = F(X_iB/\sigma)X_iB + \sigma f(X_iB/\sigma) \tag{4}$$

where F and f represent the standard normal distribution and density functions, respectively. Again setting all other covariates at their sample averages except the payment vehicle variable, mean WTP for increased expenses is $67.01 while mean WTP for the vehicle pass is $42.60. The difference in mean WTP in this case, 63 percent, is much less pronounced than with the linear model; however, it is still substantial.

CONCLUSIONS

In this study we examined the impact of a payment vehicle treatment on reported annual individual WTP to recreate at Shasta and Trinity Lakes in a typical drought year. To test for payment vehicle neutrality we employed both linear and censored regression models. Our findings strongly support rejection of the hypothesis that WTP is robust across payment vehicles within our payment card elicitation method.

The mean WTP obtained via the increased expenses question, using either model, is substantially larger than that obtained using the vehicle pass approach. The magnitude of difference between conditional mean WTP obtained by the different payment vehicles is on the order of 500 percent with the admittedly mispecified Least Squares procedure and 63 percent using the censored mean from the Tobit model. In absolute terms, the difference between the Least Squares mean WTP's is $55.08 and between the censored mean WTP's is $24.41.

We feel that these results merit attention by CV practitioners and users. When estimated separately each approach fits the data similarly. On the one hand, something as "real" as a vehicle pass may present the potential for strategic downward bidding by respondents or political pressures on the resource manager. Alternatively, something as innocuous as increased general expenses may be leading to higher WTP responses simply because respondents are more profligate in situations where it appears money will not change hands. Clearly further work is necessary to explore such issues.

From a decision making standpoint the results are also disturbing. If the results are used to decide on policy changes following an aggregation procedure like that suggested by Loomis (1987), use of either payment vehicle alone could easily lead to opposite conclusions within a benefit-cost framework. Unfortunately, we are not in a position to objectively say one payment vehicle is better than another. In fact, both of the payment vehicles we used appear widely accepted in CV studies and were suggested by current practitioners. Perhaps the best conclusion is to recommend future CV experimental design include multiple treatments (payment vehicles), otherwise we might be led to believe that our WTP estimates are more accurate and precise than they really are.

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Table 1--Ordinary Least Squares WTP Regression Estimates

VARIABLE	B[a]	T[b]
CONST	-54.477	-1.82
INCOME	8.4372	2.33
QUALITY	10.842	1.87
DLAKE	-11.293	-0.65
DPAY	55.078	3.32
$E(WTP\|X_m)$[c]	43.15	
F-STAT	5.894	
R-SQ	.0992	
R-SQ ADJ	.0842	

[a] OLS regression coefficients
[b] t-ratios
[c] sample average

Table 2--Tobit Maximum Likelihood WTP Regression Estimates

VARIABLE	MLE[a]	AT[b]	B[c]
CONST	-1.299	-4.49	-231.7
INCOM	0.0741	2.22	13.21
QUAL	0.2104	3.88	37.50
DLAKE	-0.118	-0.73	-21.08
DPAY	.32856	2.090	58.58
TOBIT	0.0056	14.46	
SQCOR[d]	0.087		
$E(WTP\|X_m)$[e]	53.76		
WTP>0	52.5%		
PWTP>0	41.6%		

[a] normalized Tobit Maximum Likelihood parameter estimates
[b] asymptotic t-ratios
[c] denormalized regression coefficients
[d] squared correlation between observed and predicted WTP
[e] censored mean with all concomitants at sample means